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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/824,754

04/15/2004

Dung-Ching Perng

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7042

7590

04/20/2005

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EXAMINER

RICHARDS, N DREW

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 04/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/824,754

Applicant(s)

PERNG, DUNG-CHING

Examiner

N. Drew Richards

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 15-22 is/are pending in the application.
- 4a) Of the above claim(s) 20-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 15-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- 1) ☐ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 12/24/04 1/3/05
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-6 and 15-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Lopatin (U.S. Patent No. 6,420,189 B1).

Lopatin discloses in figures 1-15 and on columns 1-16 an integrated circuit.

Specifically, Lopatin discloses:

a substrate (though a substrate is not specifically shown in figures 1-13, first damascene channel 102 as seen in figure 7 is considered part of the substrate, first damascene channel 102 is disclosed as being formed over active circuit elements and a dielectric on an integrated chip and thus a substrate is implicitly disclosed, column 6 lines 27-31);

a porous dielectric layer 114/110 disposed on the substrate and having a trench 108 disposed therein (figure 7; column 7 lines 45-62 teach the dielectric 114/110 being a low-K dielectric such as benzocyclobutane 'BCB' which is known in the art to be porous);

a conductor 124 disposed within the trench 108 (figure 7); and

a pore sealing layer 116/120/122, including at least two different materials bonded together and expanded, located between the conductor 124 and the dielectric layer 114/110 (the first portion of the barrier 120 is disclosed on column 6 lines 52-59 as being a variety of materials such as TaN, TaSiN, TiSiN, TiW, or alloys such as NiW, NiTa, PdW, PdTa and PdMo; the second portion of the barrier 122 is disclosed on column 9 lines 44-52 as being a variety of materials such as gold, palladium, platinum or alloys thereof; thus both portions 120/122 of the barrier are disclosed to include at least two different materials bonded together; the compounds and alloys disclosed are considered to be "expanded" as the final layer will have a thickness greater than that of either of the single materials alone; the barrier of Lopatin is considered to be a "pore sealing layer" in so much as Lopatin teaches the same materials as claimed and that they function as operable barrier layers when using a porous dielectric such as BCB).

As disclosed by Lopatin, BCB is a dielectric, however Lopatin does not explicitly state that the BCB is porous. Nonetheless, BCB is considered porous as it is known in the art that BCB is porous. As evidence that BCB is known in the art to be porous, see Lin et al. (U.S. Patent No. 5,883,011), last line of column 3 through second line of column 4. Thus, Lopatin is considered to disclose a porous dielectric.

With regard to claim 2, one of the materials includes palladium (column 9 lines 50-52).

With regard to claim 3, one of the materials includes platinum (column 9 lines 50-52).

With regard to claim 4, one of the materials includes silicon (column 6 line 54, TaSiN or TiSiN include silicon).

With regard to claim 5, the conductor 124 includes copper (124 is disclosed as Y-Ba-Cu on column 10 line 11).

With regard to claim 6, the pore sealing layer 116/120/122 has a thickness between about 2 nm to about 200 nm (see column 9 lines 39-42 and 65-67).

With regard to claim 15, at least one of the materials 116 includes a dielectric material (column 6 lines 32-33, the general term "nitride" as used herein is understood by one of ordinary skill in the art to be a common silicon nitride, which is a dielectric, further layer 116 is referred to in the cited paragraph as being part of the "interlevel dielectric" and as such must be dielectric).

With regard to claim 16, layer 120 is considered the pore sealing layer as recited in claim 1 such that Lopatin disclose an additional barrier material 122. Alternatively, layers 120 and 122 are considered the pore sealing layer as recited in claim 1 such that Lopatin disclose an additional barrier material 116.

With regard to claim 17, one of the materials is Pt and one of the materials is Si (column 6 line 54 and column 9 lines 50-52).

With regard to claim 18, one of the materials is Pd and one of the materials is Si (column 6 line 54 and column 9 lines 50-52).

With regard to claim 19, though not explicitly stated in Lopatin, the pore sealing layer 116/120/122 is considered to completely seal the surface pores of the dielectric. Lopatin discloses that their barrier layers including the seed layer and adhesion

promoting layer, successfully operate as a barrier in the device as intended. This is an implicit teaching that the layers seal the surface pores since to function properly as a barrier layer and prevent diffusion, migration or electromigration of copper into the adjacent dielectric layers, the surface pores would necessarily have been sealed.

It is noted that a secondary reference to Lin et al. is introduced in the rejections above. This secondary reference is relied upon merely as evidence and it not used to render the claims obvious, the rejection is still an anticipatory rejection under 35 U.S.C. 102. Lin et al. is merely cited to show what one of ordinary skill in the art would recognize Lopatin to disclose.

Response to Arguments

3. Applicant's arguments filed 1/27/05 have been fully considered but they are not persuasive.

Applicant has argued that Lopatin does not teach a "pore sealing layer." Applicant seems to be relying on the fact that Lopatin does not use the specific term "pore sealing layer" in describing the layers of their invention. This is not persuasive. Lopatin teaches the same materials as claimed in the instant application and these materials function as a "pore sealing layer" whether Lopatin labels them as such or not. Thus, the rejection is proper.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

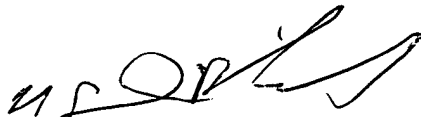
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

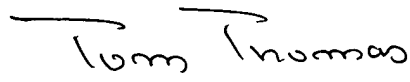
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2815

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



NDR



TOM THOMAS
SUPERVISORY PATENT EXAMINER